

CLAIMS

I/WE CLAIM:

1. An apparatus for dynamically controlling the elevation and azimuth of an aerial gun incorporated within a gun pod mountable on a fixed-wing aerial combat vehicle, the apparatus comprising the elements of:
5 at least one aerodynamically gun pod unit for storing, delivering, controlling and supporting at least one controllable elevation and azimuth movement aerial gun unit;
at least one controllable movement aerial gun unit mounted in the at least one
10 aerodynamically efficient gun pod unit and designed for the delivery of suitable gun projectile units to a / target.
2. The apparatus as claimed in claim 1 further comprises a gun movement control device to effect controllably the movement of the at least one aerial gun unit.
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3. The apparatus as claimed in claim 1 wherein the at least one aerodynamically efficient gun pod unit comprises the elements of:
at least one actuator device to respond to control signals transmitted by the gun movement control means and impart movement to at least one gun mount device;
20 at least one moveable gun mount device to support the controllable movement aerial gun unit and effect the movement of the aerial gun unit in accordance with the control signals received from the gun movement control means;
an extended gun pod aperture to provide suitable gun barrel movement volume to the at least one aerial gun unit;
25 a gun pod aperture covering to prevent ingress of the air stream into the at least one gun pod unit and to maintain efficient airflow in the vicinity of the at least one gun pod unit.
4. The apparatus as claimed in claim 3 wherein the at least one gun pod unit is
30 provided with suitable internal and external structure, component configuration, diameter and volume to allow for the controllable movement of the at least one aerial gun unit.

5. The apparatus as claimed in claim 3 wherein the at least one gun pod unit is capable of supporting the loads resulting from the high-speed, high-performance maneuvering of the fixed-wing aerial combat vehicle involving substantial G forces in accordance with the pre-determined flight envelope of the vehicle.
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6. The apparatus as claimed in claim 3 wherein the internal and external structure, component configuration, diameter and volume of the at least one gun pod unit are factors in determining the ranges of the controllable movement provided for the at least one aerial gun unit.
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7. The apparatus as claimed in claim 3 wherein the at least one gun pod unit is having a minimal impact on the aerodynamic efficiency, stability and handling characteristics of the fixed-wing aerial combat vehicle.
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8. The apparatus as claimed in claim 1 wherein the at least one gun pod unit is preferably mounted on center fuselage hard point.
9. The apparatus as claimed in claim 8 wherein the at least one gun pod unit is mountable on diversely located hard points.
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10. The apparatus as claimed in claim 1 wherein the at least one gun pod unit is an element in the weapon configuration of the fixed-wing aerial combat vehicle.
11. The apparatus as claimed in claim 1 wherein the at least one controllable movement aerial gun unit is provided with an allowable range of controllable movement in the elevation and in the azimuth.
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12. The apparatus as claimed in claim 11 wherein the allowable ranges of movement in the elevation and the azimuth are determined by the type of aerial vehicle, by the weapon configuration of the aerial vehicle, by the flight envelope of the vehicle, by the characteristics of the at least one gun pod unit, by the characteristics of the at least one aerial gun unit and by the location of the hard point whereon the at least one gun point unit is mounted.
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13. The apparatus as claimed in claim 11 wherein the allowable ranges of movement in the elevation and azimuth are determined and modified dynamically in-flight in accordance with the position of the aerial vehicle in relation to the vehicle's flight envelope, load factor, outside air pressure and the maneuver's envelope.
14. The apparatus as claimed in claim 11 wherein the allowable range of movement in the elevation and the azimuth for the at least one aerial gun unit are pre-determined.
15. The apparatus as claimed in claim 11 wherein the allowable range of movement in the elevation and in the azimuth are dynamically determined and modified in-flight.
16. The apparatus as claimed in claim 1 wherein the fixed-wing aerial combat vehicle is an attack, trainer, A/A or a multi-role military aircraft.
17. The apparatus as claimed in claim 1 wherein the fixed-wing aerial combat aircraft is an unmanned combat aerial vehicle.
18. The apparatus as claimed in claim 1 wherein the at least one gun pod unit is fixedly mounted on the fixed-wing aerial combat vehicle.
19. The apparatus as claimed in claim 1 wherein the at least one gun pod unit mounted on the fixed-wing aerial combat vehicle has a minimal controllable movement capability.
20. The apparatus as claimed in claim 3 wherein the at least one gun pod unit provides storage, delivery, control and support functions for precision-guided munitions. OK
21. The apparatus as claimed in claim 19 wherein the at least one gun pod unit provides storage, delivery, control and support functions for electronic countermeasure devices.

22. The apparatus as claimed in claim 3 wherein the at least one gun pod unit further comprises the elements of:
at least one range finder device to measure continuously the range between the gun pod unit and a target during an aerial engagement;
5 at least one processor device to perform gun movement and aiming control calculations;
at least one sensor device to capture environmental and weapon data;
at least one gun movement control and feedback device to receive control signals from the gun movement control means, activate the gun mount actuators and handle
10 feedback information from the gun mount devices, and gun mount actuators.
23. The apparatus as claimed in claim 1 wherein the at least one aerial gun unit is a M61A1 20-mm gun.
- 15 24. The apparatus as claimed in claim 22 wherein the at least one aerial gun unit is a DEFA 30-mm gun.
25. The apparatus as claimed in claim 11 wherein the allowable angle of movement in the elevation is about between 5 degrees to about 70 degrees.
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26. The apparatus as claimed in claim 11 wherein the allowable range of movement in the azimuth is about between 5 degrees to about 70 degrees..
27. The apparatus as claimed in claim 11 wherein the allowable angle of movement in the elevation is about between 5 degrees to about 70 degrees..
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28. The apparatus as claimed in claim 11 wherein the allowable range of movement in the azimuth is about between 5 degrees to about 70 degrees..
- 30 29. The apparatus as claimed in claim 3 wherein the at least one gun pod unit is a suitably modified existing gun pod unit.

30. The apparatus as claimed in claim 29 wherein the at least one gun pod unit is a novel, specifically designed, developed, tested and certified gun pod unit
- 5 31. A method for dynamically controlling the elevation and azimuth of at least one aerial gun unit incorporated within at least one gun pod unit mountable on a fixed-wing aerial combat vehicle, the method comprising the steps of:
modifying the strength, diameter and volume of the at least one gun pod unit to
allow for the incorporation of the at least one gun unit and gun movement support
10 components;
extending the diameter of the gun pod aperture to enable the allowable ranges of movement in the elevation and the azimuth for the barrels associated with the at least one gun unit;
installing an aerodynamic flexible covering on the gun pod aperture to provide for
15 efficient airflow in the vicinity of the gun pod unit.
32. The method as claimed in claim 31 further comprises the steps of:
inserting at least one flexible gun unit mount device within the at least one gun pod unit for the transmission of movement to the at least one gun unit;
20 installing at least one actuator devices within the at least one gun pod unit to impart movement to the at least one flexible gun mount devices;
installing at least one range finder device within the at least one gun pod unit to provide for measuring range between the gun pod unit and the target;
installing at least one processor device in the at least one gun pod unit to provide
25 for gun movement value calculations;
installing at least one sensor device in the at least one gun pod unit for dynamically capturing environmental and weaponry data.
33. The method as claimed in claim 31 further comprises the steps of:
30 determining the flight envelope of the fixed-wing aerial combat vehicle while the fixed-wing aerial combat vehicle carries at least one gun pod units, controllably positioning the at least one gun unit incorporated therein across the allowable ranges of movement in the elevation and in the azimuth and firing the at least one

- gun unit across the allowable range of movements in the elevation and in the azimuth;
- storing the flight envelope data within an on-board fire control computer in the fixed-wing aerial combat vehicle;
- 5 storing the flight envelope data within at least one processor device installed in the at least one gun pod unit.
- 10 34. The method as claimed in claim 31 further comprises the step of slaving the at least one controllably movable gun unit incorporated in the at least one gun pod unit to at least one onboard sensor devices. The method as claimed in claim 30 further comprises the step of manually aiming the moveable gun unit based on raw data provided to the pilot.
- 15 35. The method as claimed in claim 31 further comprises the step of slaving the at least one controllably moveable gun unit incorporated in the at least one gun pod to at least one in-pod sensor devices.
- 20 36. An apparatus for dynamically controlling the elevation and azimuth of at least one aerial gun unit incorporated within at least one gun pod unit mountable on a fixed-wing aerial combat vehicle, the system comprising the elements of:
- at least one onboard fire control computer to store gun movement control data, to receive sensor data, to receive remote data, to calculate and generate gun
- 25 movement, to communicate with the vehicle's operating crew and to communicate with the at least one gun pod unit;
- at least one onboard sensor device to collect relevant environmental information, and to transmit the information to the at least one fire control computer;
- at least one onboard communication device to communicate with at least one
- 30 remote information source and to transmit the received information to the at least one fire control computer;

- at least one aerodynamically efficient gun pod unit for storing, delivering, controlling and supporting at least one controllable elevation and azimuth movement aerial gun unit;
- at least one controllable movement aerial gun unit mounted in the at least one aerodynamically efficient gun pod unit and designed for the delivery of suitable gun projectile units to a ground-based or aerial target.
37. The apparatus as claimed in claim 36 wherein the at least one onboard fire control computer comprises the elements of:
- at least one gun movement control data structure to store gun movement limitation data, aerial vehicles flight envelope data, and weapon system envelope data;
- a gun movement calculator to calculate the optimal gun movement values based on the gun movement control data to obtain a deflection resulting in hitting the target;
- a gun movement controller and feedback handler to transmit gun movement commands to the gun pod, to receive gun movement and status feedback from the gun pod and to transmit gun movement and status feedback data to the gun movement calculator.
38. The apparatus as claimed in claim 36 wherein the at least one gun pod unit comprises the elements of:
- a gun movement controller and feedback handle to transmit gun movement control commands to the gun movement actuators and to receive status information from the actuators;
- at least one gun movement actuator to effect the movement of the flexible gun mounts.
39. The apparatus as claimed in claim 36 wherein the at least one gun pod unit further comprises at least one standalone microprocessor.
40. The apparatus of claimed in claim 36 wherein the at least one gun pod further comprise at least one range finder device.

41. The apparatus as claimed in claim 36 wherein the at least one gun pod unit further comprises at least one stand-alone sensor device.